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AUTHOR Hall, Eugene J.; Turner, Raymond C.
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ABSTRACT

The general purpose of the occupational analysis is to provide workable, basic information dealing with the many and varied duties performed in the industrial mechanics occupation. A review of the contents will provide a guide for designing and organizing a curriculum for teaching skills and knowledge essential to an industrial mechanic. The document opens with a brief introduction followed by a job description. The bulk of the document is presented in table form. Twenty-two duties are broken down into a number of tasks and for each task a two-page table is presented, showing on the first page: tools, equipment, materials, objects acted upon; performance knowledge (related also to decisions, cues and errors); safety--hazard; and on the second page: science; math--number systems; and communications (performance modes, examples, and skills and concepts). The duties involve installation, repair, and maintenance of machinery and equipment used in the production, transportation, and storage of all types of industrial materials. The document concludes with an outline of an industrial mechanics responsibilities and frequency of some preventative maintenance procedures, and a list of personal tools needed by employees. (BP)

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Occupational Analysis

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INDUSTRIAL MECHANIC

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Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University

5213

AN ANALYSIS OF THE INDUSTRIAL MECHANICS OCCUPATION

Developed By

**Eugene J. Hall
Instructor, Combination Welding
Paul C. Hayes Technical School
Grove City, Ohio**

**Raymond C. Turner
Consultant
Retired Industrial Mechanic
North American Rockwell
Columbus, Ohio**

**Occupational Analysis
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Director: Tom L. Hindes
Coordinator: William L. Ashley**

**The Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University**

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FOREWORD

The occupational analysis project was conducted by The Instructional Materials Laboratory, Trade and Industrial Education, The Ohio State University in conjunction with the State Department of Education, Division of Vocational Education pursuant to a grant from the U.S. Office of Education.

The Occupational Analysis project was proposed and conducted to train vocational educators in the techniques of making a comprehensive occupational analysis. Instructors were selected from Agriculture, Business, Distributive, Home Economics and Trade and Industrial Education to gain experience in developing analysis documents for sixty-one different occupations. Representatives from Business, Industry, Medicine, and Education were involved with the vocational instructors in conducting the analysis process.

The project was conducted in three phases. Phase one involved the planning and development of the project strategies. The analysis process was based on sound principles of learning and behavior. Phase two was the identification, selection and orientation of all participants. The training and workshop sessions constituted the third phase. Two-week workshops were held during which teams of vocational instructors conducted an analysis of the occupations in which they had employment experience. The instructors were assisted by both occupational consultants and subject matter specialists.

The project resulted in producing one hundred two trained vocational instructors capable of conducting and assisting in a comprehensive analysis of various occupations. Occupational analysis data were generated for sixty-one occupations. The analysis included a statement of the various tasks performed in each occupation. For each task the following items were identified: tools and equipment; procedural knowledge; safety knowledge; concepts and skills of mathematics, science and communication needed for successful performance in the occupation. The analysis data provided a basis for generating instructional materials, course outlines, student performance objectives, criterion measures as well as identifying specific supporting skills and knowledge in the academic subject areas.

PREFACE

The scope of the following analysis was designed to cover the work activities of installation, repair, and maintenance of various types of industrial equipment and machinery. The information reported for each task follows a generalized procedure for performing that type of work activity involved. A review of the contents will provide a guide for designing and organizing a curriculum for teaching the skills and knowledge essential to an industrial mechanic.

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The Ohio State University
Beachwood, Ohio

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Columbus Technical Institute
Columbus, Ohio

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The Ohio State University
Columbus, Ohio

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Worthington High School
Worthington, Ohio

Glenn Mann, Communications
Columbus, Ohio

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Columbus Technical Institute
Reynoldsburg, Ohio

Colleen Osinski, Psychology
Columbus Technical Institute
Columbus, Ohio

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University of Connecticut
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Columbus Technical Institute
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Barbara Hughes
Carol Marvin
Patti Nye
Kathy Roediger
Mary Salay

Research Associate
Administrative Assistant
Editorial Consultant
Typist
Typist
Typist
Typist
Typist
Typist
Typist
Typist
Typist
Typist
Typist
Typist

JOB DESCRIPTION

An Industrial Mechanic is a skilled worker involved in the installation, repair, and maintenance of machinery and equipment used in the production, transportation, and storage of all types of industrial materials. The industrial mechanic follows manufacturers' specifications and instructions and performs to exact standards.

Duty A Inspecting, Repairing, and Maintaining Chain Drive

- 1 Inspect chain drive**
- 2 Repair chain drive**
- 3 Maintain chain drive**

(TASK STATEMENT) INSPECT CHAIN DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Flashlight Socket head wrenches Wiping cloth	Remove inspection plate Operate hand crank Observe chain Observe sprocket teeth Hand check chain tension Hand crank and feel operator Listen for unusual sounds	Safety glasses
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Condition at chain drive Unusual sounds	<u>ERRORS</u> Machine failure under load

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [pressures, correct lubrication] Inertia and momentum</p>	<p>Operating dimensions</p>
COMMUNICATIONS	
PERFORMANCE MODES	EXAMPLES
<p>Reading Speaking Viewing Listening Touching</p>	<p>Inspection order Instruction to operator Inspect equipment Operating equipment Surface and parts</p>
SKILLS/CONCEPTS	
<p>Comparison, detail/inference, trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension</p>	

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Ball peen hammer
Crescent wrench
Ratchet wrench and sockets
Flashlights
Wiping cloth
Socket head wrenches
Wood blocking
Pliers
Box end wrenches
Files, flat, rat tail, bastard, 3
cornered
New cotter keys
Oil

PERFORMANCE KNOWLEDGE

Remove protective cover
Remove broken chain
Remove broken sprocket
Weld tooth on sprocket
Hand file to dress tooth
Repair chain (repair links)
Clean w/ foreign materials
Install repaired sprocket
Loosen valve block
Install chain
Adjust tension on chain
Align sprockets
Tighten valve block
Replace cover
Fill with proper oil
Run and check

SAFETY - HAZARD

Safety glass
Observe pinching joints
All files to have handles
[Smoking not permitted where
flammable liquids, and paint are
being used/store or posted]
[Report all injuries]

DECISIONS

Determine whether repair or replace
sprocket
Determine whether to repair broken
chain

CUES

Condition and life span of parts
Foreign object present

ERRORS

Machine failure under load

TASK STATEMENT)

REPAIR CHAIN DRIVE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [oil pump fluids under pressure] Read and interpret charts, tables and/or graphs Inertia and momentum Motion resulting from two or more forces acting on a point in a body [motion from a fixed point] Arrangement of molecules, atoms and ions and the effect on structure and strength of materials</p>	<p>Measures of length Measure with the Metric and English system and convert between them Operating Dimensions</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading Speaking Writing Viewing</p>	<p><u>EXAMPLES</u> Repair service order Parts and repair manual Instructions to operator Requisition for parts Equipment</p> <p><u>SKILLS/CONCEPTS</u> Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference</p>

(TASK STATEMENT) MAINTAIN CHAIN DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Ratchet and sockets
Socket head wrenches
Hammer
Wiping cloth

PERFORMANCE KNOWLEDGE

Remove cover
Align sprockets
Adjust chain tension
Clean oil sump
Replace cover

SAFETY - HAZARD

Safety glasses
Pinch points
Oil spills
Slips and falls
[Smoking not permitted where
flammable liquids and paint are
being used/stored or posted]
[Report all injuries]

DECISIONS

Determine maintenance services to
perform

CUES

Standard preventative maintenance
schedule

ERRORS

Machine failure under load

TASK STATEMENT)

MAINTAIN CHAIN DRIVE

SCIENCE		MATH — NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [sprocket] Work input, work output, friction and efficiency in simple machines (work output) [Effects of lubrication] Fluids under pressure [pressures, correct lubrication] Inertia and momentum		Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing	Preventative maintenance Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty B Inspecting, Repairing, and Maintaining Direct Drive

- 1 Inspect direct drive coupling**
- 2 Repair direct drive coupling**
- 3 Maintain direct drive coupling**

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Flashlight Wiping cloth Socket head wrenches Socket wrenches Screwdrivers	Remove inspection plate Observe while running Listen for unusual noise Feel vibration Try to achieve harmonics of coupling (Adjust speed to remove) Stop machine, feel heat of couplings Observe lubrication	Safety glasses Caution - moving parts Grease or oil spills [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repair - needed	<u>CUES</u> Condition of equipment, vibration, heat	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) INSPECT DIRECT DRIVE COUPLING

ASK STATEMENT) INSPECT DIRECT DRIVE COUPLING		MATH — NUMBER SYSTEMS
SCIENCE Hookes Law Work input, work output, friction and efficiency in simple machines [Effects of lubrication] Resistance of materials to change in shape [twisting, bending] Harmonies (vibration noise factor) Relationship of force to distortion in an elastic body	Operating dimensions	
COMMUNICATIONS		
PERFORMANCE MODES Reading Speaking Viewing Listening Touching	EXAMPLES Inspection order Instructions of operator Inspect equipment Operating equipment Surface and parts	SKILLS/CONCEPTS Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR DIRECT DRIVE COUPLING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Ratchet and sockets Socket head wrenches File Two dial indicators Aviation snips Shim stock (brass) Electric drill motor and drills Extension cord Reamer Flashlight Inspection mirror Straight edge Grease (if required) Grease gun Taper pins</p>	<p>Lock out main switch Remove guard Remove motor mount bolts Loosen coupling set screws Slide motor back Remove coupling Deburr shafts Align motor shaft with gear box shaft Drill and ream two opposing corners for taper pins Move motor back Realign motor Install taper pins and mounting bolts Install coupling Lubricate as required Install guard Run and check</p>	<p>Safety glasses File handle on all files Lock out main switch Smoking not permitted where flammable liquids and paint are being used or stored or where posted Report all injuries Check for pinch points Ear plugs to be worn in a high noise level area</p>
<p><u>DECISIONS</u></p> <p>Determine whether to repair or replace worn coupling</p>	<p><u>CUES</u></p> <p>Misalignment: lack of lubricant, condition and life span of parts</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

TASK STATEMENT) REPAIR DIRECT DRIVE COUPLING

SCIENCE		MATH - NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines [Effects of lubrication] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [twisting, and bending] Perfect elasticity (Hookes Law) Harmonies	Measure of length Measure of time and speed Operating dimensions	
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Writing Viewing	Repair service order Parts and repair manual Instruction to operator Requisition for parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN DIRECT DRIVE COUPLING

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Socket head wrenches Ratchet and sockets Screwdrivers Flash light Grease gun Grease</p>	<p>Lock out main switch Remove guard Tighten motor mount screws and gear box screws Tighten coupling set screws Tighten coupling cover screws Lubricate coupling Install guard Run and check</p>	<p>Safety glasses Lock out main switch Watch for pinch points. Oil, grease or debris on floor [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<p><u>DECISIONS</u></p> <p>Determine maintenance services to perform</p>	<p><u>CUES</u></p> <p>Standard preventative maintenance schedule</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

TASK STATEMENT) MAINTAIN DIRECT DRIVE COUPLING

SCIENCE		MATH - NUMBER SYSTEMS
Hookes Law Relationship of force to distortion in an elastic body Resistance of materials to change in shape [twisting and bending] Harmonies Effects of lubrication		Measure of speed and time [speed and RPM] Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty C Inspecting, Repairing, and Maintaining Flat Belt

- 1 Inspect flat belt drive**
- 2 Repair flat belt drive**
- 3 Maintain flat belt drive**

(TASK STATEMENT) INSPECT FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Flashlight

PERFORMANCE KNOWLEDGE

Check lagging on head pulley
Check belt tension
Check wear on belt
Check alignment
Check mounting bolts
Check idler bearings
Check for vibration
Check grease in motor bearing
Check shaft bearing
Check driven shaft for whip
Check take-up adjustment

SAFETY — HAZARD

Safety glasses
Grease on floor
Debris on floor

[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

DECISIONS

Determine repairs needed

CUES

Condition of equipment, vibration,
tension, alignment

ERRORS

Machine failure under load

ASK STATEMENT) INSPECT FLAT BELT DRIVE

SCIENCE		MATH — NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [belts and pulleys]</p> <p>Work input, work output, friction and efficiency in simple machines [friction]</p> <p>Effect of heating and cooling on expansion of materials [change of dimension]</p> <p>Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter]</p> <p>Relationship of force to distortion in an elastic body [elastic body]</p> <p>Resistance of materials to change in shape [stretching]</p>		Measures of length, width, thickness Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching	Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, terminology

(TASK STATEMENT) REPAIR FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Belt clamps
Come-a-long
Square
Belt knife
Hammer
Lacing
Crescent wrenches
Side cuts

PERFORMANCE KNOWLEDGE

Release tension on idler roll
Remove lacing pin from belt
Fasten belt clamps to belt
Engage come-a-long to overlap belt
Mark belt to desired length
Square both ends
Cut belts to remove excess
Install new lacing
Operate come-a-long to install pin
Release come-a-long
Remove belt clamps
Adjust take up idler
Run and check belt

SAFETY - HAZARD

Safety glasses

No finger rings or watches

To protect one's self from moving equipment, rope off or barricade area around machine

Observe pinch points

[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

DECISIONS

Determine if belt is slipping

CUES

Tension

ERRORS

Stretched belt

TASK STATEMENT) REPAIR FLAT BELT DRIVE

SCIENCE

Simple machines used to gain mechanical advantage [pulleys and belts]
 Work input, work output, friction and efficiency in simple machines [friction]
 Effect of heating and cooling on expansion of materials [change of dimension]
 Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter]
 Relationship of force to distortion in an elastic body
 Resistance of materials to change in shape [stretching]

MATH - NUMBER SYSTEMS

Measures of length, width and thickness
 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading
 Speaking
 Writing
 Viewing

EXAMPLES

Repair service order
 Parts and repair manual
 Instructions to operator
 Requisition for parts
 Equipment

SKILLS/CONCEPTS

Comprehension, detail/inference, trade terminology
 Description of mechanism, definition, instructions
 Trade terminology, enunciation, clarity of expression, logic
 Penmanship, spelling, classification, terminology
 Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN FLAT BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Grease
Grease gun
Crescent wrench
Lacing pin

PERFORMANCE KNOWLEDGE

Replace belt lacing pin
Adjust take-up
Adjust alignment
Lubricate idler

SAFETY - HAZARD

Safety glasses
Observe pinch points
Apply crescent wrench in proper manner
to prevent jaws from spreading
[Smoking not permitted where flamma-
ble liquids and paint are being
used/stored or posted]
[Report all injuries]

DECISIONS

Determine maintenance services to
perform

CUES

Standard preventative maintenance
schedule

ERRORS

Machine failure under load

SCIENCE

MATH - NUMBER SYSTEMS

Resistance of materials to change in shape
Accommodation of materials to change in shape

Measures of length, width, and thickness
Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading

Speaking

Viewing

EXAMPLES

Preventative maintenance schedule

Instructions to operator

Equipment

SKILLS/CONCEPTS

Comprehension, detail/inference,
description of mechanism, trade
terminology

Trade terminology, enunciation, clarity
of expression, logic

Visual analysis, describing, logic,
detail/inference

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Duty D Inspecting, Repairing, and Maintaining Gear Drive

- 1 Inspect open gear drive**
- 2 Repair open gear drive**
- 3 Maintain open gear drive**

(TASK STATEMENT) INSPECT OPEN GEAR DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Work platform
Ratchet wrench and socket
Ball peen hammer
Flashlight
Socket head wrenches

SAFETY - HAZARD

Safety glasses
Pinch points
No "make shift" defective
Scaffolds, rigging or staging
[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

PERFORMANCE KNOWLEDGE

Install work platform
Remove guard
Run continuously
Listen for knocks
Observe bull gear for wobble
Observe pinion shaft for whip
Check bearings for heat
Observe pinion gear wobble
Inspect taper keys for looseness
Hammer blows for cracked gear
Hammer blows for cracked shaft
Verify correct grease

DECISIONS

Determine repairs needed

CUES

Condition of gear drive:sound

ERRORS

Machine failure under load

SCIENCE	MATH - NUMBER SYSTEMS
<p>Arrangement of molecules, atoms, ions, and the effect on structure and strength of materials Effect of heating and cooling on state of matter Effects of lubrication</p>	<p>Measure length, width and thickness Operating dimensions</p>
COMMUNICATIONS	
PERFORMANCE MODES	EXAMPLES
<p>Reading Speaking Viewing Touching</p>	<p>Inspection order Instructions to operator Inspect equipment Surface and parts</p>
SKILLS/CONCEPTS	
<p>Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Auditory discrimination, concentration, noise discrimination Shape, texture, movement, torsion</p>	

(TASK STATEMENT) REPAIR OPEN GEAR DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Ratchet wrenches and sockets
Socket head wrenches
Ball peen hammer (medium)
Brass rod
Flashlight
File
Emery cloth
Gear puller
Center punch
Open gear lubricant
Putty knife
Work platform
Feeler gauges

PERFORMANCE KNOWLEDGE

Properties of open gear lubricant
Place work platform
Remove guard
Remove key
Remove pinion gear
Inspect shaft damage
Deburr shaft
Acquire new key
Install pinion gear on shaft, adjust clearance
Align keyways
Match "witness" marks
Install new wedge key
Lubricate gears
Replace guard
Unlock switch-check operation

SAFETY - HAZARD 35

Safety glasses
Secure main switch (lock out)
No horse play
Watch for fork trucks
Check for pinch points
Handle for file
[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

DECISIONS

Determine if key is sheared

CUES

Condition and life span of parts

ERRORS

Machine failure under load

(TASK STATEMENT) REPAIR OPEN GEAR DRIVE

SCIENCE		MATH - NUMBER SYSTEMS
<p>Inertia and momentum</p> <p>Work input, work output, friction and efficiency in simple machines [friction]</p> <p>Effects of friction on work processes and product quality</p> <p>Arrangement of molecules, atoms, ions and the effect on structure and strength of materials</p> <p>Hook's Law, Electrololysis</p> <p>Shear modulus or the coefficiency of rigidity is the ratio of the stress to strain for the case of a shear or a twist; it the shearing stress divided by the fractional shear</p> <p>Effects of heating and cooling on state of matter [gaskets]</p> <p>Resistance of materials to change in shape [to torque]</p> <p>Effects of eccentric loading; of wear on gear</p> <p>Transfer of heat from one body to another [heat on materials]</p> <p>Effect of lubrication; of severe vibration on materials</p> <p>Relationship of force to distortion in an elastic body</p>		<p>Torque (inch pounds) = force pounds x radius (inches)</p> <p>Simple machines used to gain mechanical advantage [gears]</p> <p>Operating dimensions</p>
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Repair service order	Comprehension, detail/inference, trade terminology
Speaking	Parts and repair manual	Description of mechanism, definition, instructions
Writing	Instructions to operator	Trade terminology, enunciation, clarity of expression, logic
Viewing	Requisition for parts	Penmanship, spelling, classification, terminology
	Equipment	Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN OPEN GEAR DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Ratchet and socket
Ball peen hammer
File
Work platform
Flashlight
Open gear lubricant
Putty knife

PERFORMANCE KNOWLEDGE

Place work platform
Remove guard
Clean pinion and bull gear
Adjust clearance between teeth
Deburr teeth pinion and bull gear
Set wedge keys firmly
Lubricate
Replace guard

SAFETY - HAZARD

Safety glasses
Pinch points

[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

DECISIONS

Determine maintenance services to perform

CUES

Standard preventative maintenance schedule

ERRORS

Machine failure under load

SCIENCE	MATH - NUMBER SYSTEMS
<p>Effects of friction on work processes and product quality Torque Effects of lubrication</p>	<p>Measure of length, width and thickness Operating dimensions</p>
COMMUNICATIONS	
<p><u>PERFORMANCE MODES</u></p> <p>Reading Speaking Viewing</p>	<p><u>EXAMPLES</u></p> <p>Preventative maintenance schedule Instructions to operator Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference</p>

Duty E Inspecting, Repairing, and Maintaining Gear Box Drive

- 1 Inspect gear box drive
- 2 Repair gear box drive
- 3 Maintain gear box drive

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON

Flashlight
Wiping cloth
Socket head cap screw wrenches
Eye bolt
Nylon sling
Chain hoist
Ladder
Tag line

SAFETY - HAZARD

Safety glasses
Oil spills
Falls from ladder
Smoking could cause fire
[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

PERFORMANCE KNOWLEDGE

Listen to gear box run
Feel for heat
Smell for unusual odor
Vibration factor
Check oil level leaks
Shut off
Secure safety switch
Check mounting screws, external
Remove cover plate and secure
Inspect gears (visual)
Inspect bearings feel end play
Inspect shafting
Inspect breather (clean)
Inspect oil residue, sludge
Inspect oil seals and gaskets
Replace cover

DECISIONS

Determine repairs needed

CUES

Unusual noises, temperature, odor, vibrations

ERRORS

Machine failure under load

SCIENCE

Effect of heating and cooling on state of matter [gaskets]
 Simple machines used to gain mechanical advantage
 Work input, work output, friction and efficiency in simple machines
 Resistance to torque
 Effect of wear on gear
 Transfer of heat from one body to another
 Effect of severe vibration on materials
 Effect of eccentric loading
 Effect of heat on materials
 Relationship of force to distortion in an elastic body
 Arrangement of molecules, atoms and ions and the effect on structure and strength of materials
 Resistance of materials to change in shape
 Effects of lubrication

MATH - NUMBER SYSTEMS

Liquid and dry measures [liquid measures]
 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading
 Speaking
 Viewing
 Listening
 Touching

EXAMPLES

Inspection order
 Instructions to operator
 Inspect equipment
 Operating equipment
 Surface and parts

SKILLS/CONCEPTS

Comprehension, detail/inference, trade terminology
 Trade terminology, enunciation, clarity of expression, logic
 Visual analysis, describing, logic, detail/inference
 Auditory discrimination, concentration, noise discrimination
 Shape, texture, movement, torsion

(TASK STATEMENT) REPAIR GEAR BOX DRIVE

42

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Socket head wrenches Persuader($\frac{1}{2}$ -inch pipe, 12-inch long) Drain pan Wiping cloth Work bench Ball peen hammer Brass rod File Flashlight Stoddard solvent Lubricants	Remove cover plates Drain oil Inspect gears and bearings Remove broken parts (teeth) Remove shaft with broken gear Remove shaft with companion gear Flush and clean box Wipe dry Replace gear and mating gear Flush and clean box Wipe dry Replace gear and mating gear in box Reinstall gear train and bearings Reinstall retainer caps Reinstall cover plate Fill with proper oil to desired level Run and check for operation Know properties and addition of oil	Safety glasses Oil on floor Operator shut off machine and secure Never pour flammable liquids in sewers or drains Use caution when working on machines that are jammed [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine if the trains locked Determine whether to repair or replace parts	<u>CUES</u> Defecting gear Condition and life span of parts	<u>ERRORS</u> Machine failure under load

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MATH — NUMBER SYSTEMS		SCIENCE	
Liquid measure Operating dimensions		Lubricants Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials Simple machines used to gain mechanical advantage Effects of lubricants	
COMMUNICATIONS			
PERFORMANCE MODES		EXAMPLES	
Reading		Repair service order	
Speaking		Parts and repair manual	
Writing		Instruction to operator	
Viewing		Requisition for parts Equipment	
SKILLS/CONCEPTS		Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference	

(TASK STATEMENT) MAINTAIN GEAR BOX DRIVE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
<p>Flashlight Wiping cloth Socket head wrenches Small screwdriver Large screwdriver Lubricants</p>	<p>Check oil level Check for leaks Check for hot bearings Check for odor of hot oil Check for loose cap screws Listen for noise Feel for vibration Properties of lubricant</p>	<p>Safety glasses Whenever more than one employee is working on the same equipment, each employee should attach safety lock to the switch, and remove it only when job is completed No spitting on floor or equipment [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<p><u>DECISIONS</u> Determine maintenance services to perform</p>	<p><u>CUES</u> Standard preventative maintenance schedule</p>	<p><u>ERRORS</u> Machine failure under load</p>

TASK STATEMENT) MAINTAIN GEAR BOX DRIVE		MATH - NUMBER SYSTEMS
SCIENCE	Liquid and dry measures Operating dimensions	
Simple machines used to gain mechanical advantage Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Amount of oil too much/too little Oil grooves Effects of lubricants		
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty F Inspecting, Repairing, and Maintaining Rack and Pinion Drive

- 1 Inspect rack and pinion drive**
- 2 Repair rack and pinion drive**
- 3 Maintain rack and pinion drive**

(TASK STATEMENT) INSPECT RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth Lubricants	Lock out main switch Wipe and clean rack and pinion Inspect for burrs Inspect for bent or broken teeth Hand operate for smooth operation Relubricate gears	Safety glasses Oil spills [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Burrs Condition and life span of parts	<u>ERRORS</u> Machine failure under load

SCIENCE

Simple machines used to gain mechanical advantage [gears]
 Work input, work output, friction and efficiency in simple machines
 Inertia and momentum
 Arrangement of molecules, atoms and ions and the effect on structure and strength of materials
 Resistance of materials to change in shape
 Effects of lubricants

MATH - NUMBER SYSTEMS

Measures of length, width and thickness
 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading
 Speaking
 Viewing
 Listening
 Touching

EXAMPLES

Inspection order
 Instructions to operator
 Inspect equipment
 Operating equipment
 Surface and parts

SKILLS/CONCEPTS

Comprehension, detail/inference, trade terminology
 Trade terminology, enunciation, clarity of expression, logic
 Visual analysis, describing, logic, detail/inference
 Auditory discrimination, concentration, noise discrimination
 Shape, texture, movement, torsion

(TASK STATEMENT) REPAIR RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Socket head wrenches
 Ratchet wrench and sockets
 Hammer
 Flashlight
 Gear puller
 File
 Lubricants

PERFORMANCE KNOWLEDGE

Lock out main switch
 Remove hand crank
 Remove shaft bearing assembly
 Remove broken pinion
 Install new pinion on shaft
 Reinstall assembly in saddle
 Reinstall hand crank
 Operate hand crank for smooth operation
 Lubricants

SAFETY - HAZARD

Safety glasses
 Pinch points
 Handle for file

[Smoking not permitted where flammable liquids and paint are being used/stored or posted]

[Report all injuries]

DECISIONS

Determine whether to repair or replace pinion gear and rack

CUES

Condition and life span of parts

ERRORS

Carriage lock

Unreleased, machine failure under load

Simple machines used to gain mechanical advantage [gears]
 Work input, work output, friction and efficiency in simple machines
 Inertia and momentum [body at rest, body in motion]
 Arrangement of molecules, atoms and ions and the effect on structure and strength of materials [strength of material]
 Resistance of materials to change in shape
 Effects of lubrication

Measure of length [pinion dimensions]
 Wrench dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading

Speaking

Writing

Viewing

EXAMPLES

Repair service order

Parts and repair manual

Instructions to operator

Requisition for parts

Equipment

SKILLS/CONCEPTS

Comprehension, detail/inference, trade terminology

Description of mechanism, definition, instructions

Trade terminology, enunciation, clarity of expression, logic

Penmanship, spelling, classification, terminology

Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN RACK AND PINION DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Brush Stoddard solvent Wiping cloth Flashlight File Lubricants</p>	<p>Lock out main switch Clean rack and pinion with small brush and solvent Wipe dry Deburr rack and pinion Wipe clean Lubricate Check for smooth operation</p>	<p>Safety glasses File handle on file [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

SCIENCE

Simple machines used to gain mechanical advantage [gears]
 Work input, work output, friction and efficiency in simple machines
 Inertia and momentum
 Arrangement of molecules, atoms and ions and the effect on structure and strength of materials
 Resistance of materials to change in shape
 Effects of lubricants

MATH — NUMBER SYSTEMS

Wrench dimensions
 Operating dimensions

COMMUNICATIONS

PERFORMANCE MODES

Reading

Speaking

Viewing

EXAMPLES

Preventative maintenance schedule

Instructions to operator

Equipment

SKILLS/CONCEPTS

Comprehension, detail/inference,
 description of mechanism, trade
 terminology

Trade terminology, enunciation, clarity
 of expression, logic
 Visual analysis, describing, logic,
 detail/inference

Duty G Inspecting, Repairing, and Maintaining Ring and Pinion Drive

- 1 Inspect ring and pinion drive of vertical lathe
- 2 Repair ring and pinion drive of vertical lathe
- 3 Maintain ring and pinion drive of vertical lathe

(TASK STATEMENT) INSPECT RING AND PINION DRIVE OF VERTICAL LATHE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth Feeler gauges	Raise rail to extreme position Remove inspection plate in chuck Check retaining nut Reinstall plate Check ring and pinion for burrs, broken teeth, wear Listen to operation Feel for vibration Check lubrication	Safety glasses Caution - moving machinery [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Burrs, broken teeth; unusual sounds and vibrations; condition and lifespan of parts	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) INSPECT RING AND PINION DRIVE OF VERTICAL LATHE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Fluids under pressure - lubricants Transfer of energy from one form to another Inertia and momentum Effects of lubricants</p>	<p>Operating dimensions Operating clearances</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading Speaking Viewing Listening Touching</p>	<p><u>EXAMPLES</u></p> <p>Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension</p>

(TASK STATEMENT) REPAIR RING AND PINION DRIVE OF VERTICAL LATHE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Ratchet wrench and socket extension Socket head wrenches Torque wrench Feeler gauge Wiping rags Flashlight Oil can, oil Pick-up clamps Eye bolt Three-legged chocker Fork truck or overhead crane	Raise rail, move heads to extreme position Lock out: main switch Remove inspection plate in chuck Remove retaining nut Install three pick-up clamps on chuck Lift off chuck Lay chuck on block - inverted Remove pinion gear and gear box Remove broken ring gear on chuck Install new ring gear on chuck Remove pinion gear and shaft Install new pinion gear, shaft, and bearings Reinstall pinion gear, gear box, and chuck Tighten retaining nut (torque) Adjust pinion gear to ring gear, use feeler gauge Lubricate, run and check Replace inspection plate in chuck	Safety glasses Pinch points Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries
Determine whether to repair or replace parts	Condition and life span of parts	Machine failure under load
<u>DECISIONS</u>	<u>CUES</u>	<u>ERRORS</u>

TASK STATEMENT) REPAIR RING AND PINION DRIVE OF VERTICAL LATHE

SCIENCE		MATH — NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Fluids under pressure Transfer of energy from one form to another Inertia and momentum Torque Effects of lubricants		Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Writing Viewing	Repair service order Instructions to operator Requisition for parts Equipment	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

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(TASK STATEMENT) MAINTAIN RING AND PINION DRIVE OF VERTICAL LATHE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Flashlight Feeler gauge Ratchet wrench, sockets and extension Wiping cloth	Raise rail to extreme height Lock out main switch Remove inspection plate Adjust retaining nut if required Reinstall plate Check and adjust gear tooth clearance Deburr teeth - gear and pinion Lubricate as required Run and check	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN RING AND PINION DRIVE OF VERTICAL LATHE

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears] Work input, work output, friction and efficiency in simple machines Fluids under pressure [lubricants] Transfer of energy from one form to another Inertia and momentum Effects of lubricants		Basic math skills Feeler gauge Operating dimensions
COMMUNICATIONS		
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty H Inspecting, Repairing, and Maintaining Variable Speed Drive

- 1 Inspect variable speed drive**
- 2 Repair variable speed drive**
- 3 Maintain variable speed drive**

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(TASK STATEMENT) INSPECT VARIABLE SPEED DRIVE

61

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Ratchet and sockets Flashlight Wiping cloth	Remove inspection plate Observe belt Listen for belt slap Hand feel for vibration on motor Inspect all mounting bolts Inspect variable pulleys	Safety glasses Lock out main switch Do not talk to any operator while operating a machine Ordinary prescription glasses do not protect the eyes Wear safety caps if employee has long hair [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Unusual sounds or vibrations; condition of equipment	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) INSPECT VARIABLE SPEED DRIVE

MATH — NUMBER SYSTEMS		SCIENCE
Measure of time and speed [speed-RPM] $FPM = \text{Diameter} \times \text{RPM} \times .262$ Operating dimensions		Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum [inertia] Relationship of force to distortion in an elastic body [distortion] Resistance of materials to change in shape [stretching] Effects of lubricants
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching	Inspection on order Instructions to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visually analysis; describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE-KNOWLEDGE	SAFETY -- HAZARD
<p>Ratchet wrench and sockets Socket head wrenches Snap ring wrench Flashlight Hammer Feet per minute meter</p>	<p>Lock out master switch Remove guard and conveyor belt from variable drive Retract motor to relax spring in drive pulley; loosen motor from base Remove belt from driver and driven pulley, spring loaded pulley from shaft, snap ring from sheave, and spiral spring cartridge and nylon key Install new spiral spring cartridge and key; lube shaft Install snap ring to shaft and new belt Align motor and bolt down Rotate by hand to equalize belt Start motor for operational check Install conveyor belt Run conveyor-operational check Adjust pulley pitch to required feet per minute Reinstall guard</p>	<p>Safety glasses Never climb or walk over conveyors Never use defective hammers, punches or wrenches Never strike together material of equal hardness Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries</p>
<p><u>DECISIONS</u></p> <p>Determine whether to repair or replace broken spring Determine whether to repair or replace damaged belt</p>	<p><u>CUES</u></p> <p>Condition and life span of parts</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

TASK STATEMENT) REPAIR VARIABLE SPEED DRIVE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching] Hooks Law Effects of lubricants</p>	<p>Measure of time and speed [RPM] $\text{FPM} = \text{Diameter (inches)} \times \text{RPM} \times .262$ Operating dimensions</p>
COMMUNICATIONS	
PERFORMANCE MODES	SKILLS/CONCEPTS
<p>Reading</p> <p>Speaking</p> <p>Writing</p> <p>Viewing</p>	<p>Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference</p>

(TASK STATEMENT) MAINTAIN VARIABLE SPEED DRIVE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Grease gun Flashlight Wiping cloth	Grease all fittings Operate fast and slow for proper operation Snug up all mounting bolts	Safety glasses Lock out main switch [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN VARIABLE SPEED DRIVE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines Inertia and momentum [inertia] Relationship of force to distortion in an elastic body [distortion] Resistance of materials to change in shape [stretching] Effects of lubricants</p>	<p>Measure of time and speed {speed - RPM} $FPM = \text{Diameter} \times RPM \times .262$ Operating dimensions</p>
COMMUNICATIONS	
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u> <u>SKILLS/CONCEPTS</u>
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty I Inspecting, Repairing, and Maintaining Vee Belt Drive

- 1 Inspect vee belt drive
- 2 Repair vee belt drive
- 3 Maintain vee belt drive

(TASK STATEMENT)

INSPECT VEE BELT DRIVE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Belt tension meter Straight edge	Open door Check sheaves alignment and wear Check belt tension Check for cleanliness Inspect belts for wear Check for vibration Check mounting bolts	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine belt condition Determine if area needs cleaning	<u>CUES</u> Condition of equipment; tension, vibration Noise	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) INSPECT VEE BELT DRIVE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage, [pulleys] Work input, work output friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials Inertia and momentum Effect of friction on work processes and product quality [friction] Relationship of force to distortion in an elastic body Resistance of materials to change in shape Effects of lubricants</p>	<p>Relation of force to distortion an elastic body [belt deflection under pressure] Operating dimensions</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading Speaking Viewing Listening Touching</p>	<p><u>EXAMPLES</u></p> <p>Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension</p>

(TASK STATEMENT) REPAIR VEE BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
<p>Set of new matched belts Adjustable wrench (crescent) Flashlight Stoddard solvent Wiping cloths Knife Wire brush Debris pan Socket head wrenches Belt tension meter Sheave groove and belt gauge Select-o-matic V-belt measuring device Hammer</p>	<p>Open inspection door Release belt tension Remove old belts Determine length, size, quantity of belts and obtain clean sheaves Inspect sheaves Bell ring sheaves Check sheave retaining screws Check alignment of sheaves and adjust Install new belts Adjust tension Close door Run and check</p>	<p>Safety glasses Debris on floor Oil on floor Never roll or pry belts on sheave (pinch point) Clean up all rags and material from floor upon completing assignment While working overhead, never carry tools in pockets Never use kerosene to clean parts or assemblies Auxiliary start button lock out Wrenches must never be used as hammer [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<p><u>DECISIONS</u></p> <p>Determine when to replace worn belts</p>	<p><u>CUES</u></p> <p>Misalignment, grit and dirt, normal wear Cracked sheaves (pulleys) do not ring</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

MATH - NUMBER SYSTEMS	
SCIENCE	MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effects of heating and cooling on expansion of materials Inertia and momentum Effects of friction on work processes and product quality [friction] Relationship of force to distortion in an elastic body Resistance of materials to change in shape [stretching]	Measures of length Matching length Matching belts Matching width Relationship of force to distortion in an elastic body [deflection under pressure] Operating dimensions Chart
COMMUNICATIONS	
PERFORMANCE MODES	EXAMPLES
Reading Speaking Writing Viewing	Repair service order Parts and repair manual Instructions to operator Requisition for parts Equipment
SKILLS/CONCEPTS	
Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference	

(TASK STATEMENT) MAINTAIN VEE BELT DRIVE

TOOLS, EQUIPMENT, MATERIALS,
OBJECTS ACTED UPON

Stoddard solvent
Wiping cloth
Flashlight
Adjustable wrench
Straight edge
Hammer
Socket head wrenches (Allen)
Belt tension meter

PERFORMANCE KNOWLEDGE

Open inspection door
Clean belts (solvent)
Clean sheaves and area
Adjust belt tension
Check and correct sheave alignment
Close and secure door

SAFETY - HAZARD

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Safety glasses
Pinch points
No finger rings
[Smoking not permitted where flammable liquids and paint are being used/stored or posted]
[Report all injuries]

DECISIONS

Determine belt condition
Determine sheave condition

CUES

Standard preventative maintenance schedule

ERRORS

Machine failure under load

ASK STATEMENT) MAINTAIN VEE BELT DRIVE

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effects of heating and cooling on expansion of materials Inertia and momentum Effect of friction on work processes and product quality [friction] Relationship of force to displacement in an elastic body Resistance of materials to change in shape [stretching]</p>	<p>Operating dimensions</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading Speaking Viewing</p>	<p><u>EXAMPLES</u></p> <p>Preventative maintenance schedule</p> <p>Instructions to operator</p> <p>Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference</p>

Duty J Inspecting, Repairing, and Maintaining Centrifugal Clutch

- 1 Inspect centrifugal clutch
- 2 Repair centrifugal clutch
- 3 Maintain centrifugal clutch

(TASK STATEMENT) INSPECT CENTRIFUGAL CLUTCH

75

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Flashlight Strobotac Two indicators Inspection mirror Wiping cloth	Run system Check with strobotac (slippage) Check alignment	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Condition of equipment, slippage, alignment, heat, smoke	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) INSPECT CENTRIFUGAL CLUTCH

SCIENCE	MATH -- NUMBER SYSTEMS
Newton's laws of motion (1-3) Centrifugal forces developed by bodies in rotation Transfer of energy from one form to another Inertia and momentum	Operating condition
COMMUNICATIONS	
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>
Reading Speaking Viewing Listening Touching	<u>SKILLS/CONCEPTS</u> Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR CENTRIFUGAL CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Socket head wrenches Flash light Wiping cloth Strobotac Friction tape Feeler gauges	Lock and secure main switch Loosen set screws on rim Slide rim toward motor and shaft Remove old drive blocks Align clutch driver and clutch Install new matched blocks in pairs at 180° Return rim and secure Run and check for slippage Dispose of all parts	Safety glasses Pinch points [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine whether to repair or replace worn blocks	<u>CUES</u> Slippage Fatigue of block Hot rim-clutch Life span of equipment Smoke	<u>ERRORS</u> Machine failure under load

MATH - NUMBER SYSTEMS	
SCIENCE	
Newton's Laws of motion (1-3) Transfer of energy from one form to another Centrifugal forces developed by bodies in rotation Inertia and momentum Effects of friction on work processes and product quality [friction]	Measure of time and speed Measure of weight Measures of temperature Operating dimensions
COMMUNICATIONS	
<u>PERFORMANCE MODES</u> Reading Speaking Writing Viewing	<u>EXAMPLES</u> Repair service order Parts and repair manual Instructions to operator Requisition of parts Equipment <u>SKILLS/CONCEPTS</u> Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN CENTRIFUGAL CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Socket head wrenches Flashlight Air hose Blow gun Strobotac</p>	<p>Lock and secure main switch Remove flange Blow out dust and dirt Check blocks, (must be free) Check and tighten set screws Install flange Run and check for slippage</p>	<p>Safety glasses Goggles Flying dust from compressed air [Smoking not permitted where flammable liquids and paint are being used/stored or possible] [Report all injuries.]</p>
<p><u>DECISIONS</u></p> <p>Determine maintenance services to perform</p>	<p><u>CUES</u></p> <p>Standard preventative maintenance schedule</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

ASK STATEMENT) MAINTAIN CENTRIFUGAL CLUTCH

SCIENCE	MATH - NUMBER SYSTEMS
<p>Newton's Laws of Motion Centrifugal forces developed by bodies in rotation Transfer of energy from one form to another Inertia and momentum Friction makes heat and debris</p>	<p>Operating conditions</p>
COMMUNICATIONS	
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>
<p>Reading Speaking Viewing</p>	<p>Preventative maintenance schedule Instructions to operator Equipment</p>
<u>SKILLS/CONCEPTS</u>	
<p>Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference</p>	

Duty K Inspecting, Repairing, and Maintaining Pneumatic Clutch and Brake

- 1 Inspect pneumatic clutch and brake**
- 2 Repair pneumatic clutch**
- 3 Maintain pneumatic clutch**

(TASK STATEMENT) INSPECT PNEUMATIC CLUTCH AND BRAKE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Flashlight Wiping cloth Belt tension tester Air gauge	Shut-off machine Observe for excessive grease Frayed wiring Inspect air hose, and air valve Check belts through inspections hole for wear and tension Inspect clutch and brake pads for wear Check lubrication Request operator to "dry run" machine Look and listen for faulty operation Check limit switches Examine air hose with pressure Check air pressure	Safety glasses Caution - moving machinery Caution - slips and falls Grease spills [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
Determine repairs needed	Condition of equipment	Machine failure under load
<u>DECISIONS</u>	<u>CUES</u>	<u>ERRORS</u>

ASK STATEMENT) INSPECT PNEUMATIC CLUTCH AND BRAKE

ASK STATEMENT/INSPECT PNEUMATIC CLUTCH AND BRAKE		MATH - NUMBER SYSTEMS	
SCIENCE		Operating dimensions	
<p>Simple machines used to gain mechanical advantage [pulleys] Work input, workout put, friction and efficiency of simple machines [friction kinetic and potential] Effects of friction on work processes and product quality effects of friction on wear process] Inertia and momentum Newton's Laws of motion Lubricants Gas under pressure Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching]</p>			
COMMUNICATIONS			
<u>PERFORMANCE MODES</u>		<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Viewing Listening Touching		Inspection order Instructions to operator Inspection equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

COMMUNICATIONS

(TASK STATEMENT) REPAIR PNEUMATIC CLUTCH

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Ratchet extension and sockets Socket head wrenches Ball peen hammer New brake pads New clutch pads Grease gun Grease Wiping cloth Flashlight Extension cord and light Timber and blocking Sling and hoist Air pressure gauge	Lock out main switch Remove cover plate Block ram Shut off air supply Remove rotating air valve, solenoid valve, pad mounting housing, clutch pads, brake housing, and brake pads Bell ring disc and housing Install brake pads, brake housing, clutch pads, clutch housing, rotating air valve, and solenoid valve Lubricate bearings Check air pressure Turn on air Remove blocking Run and check operation Install cover plates	Safety glasses Grease, spills Pinch points Slips or falls Caution on compressed air Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries
<u>DECISIONS</u> Determine whether to repair or replace clutch parts	<u>CUES</u> Condition and life span of parts	<u>ERRORS</u> Lack of transmitted power Ram drifts Weak ram thrust Machine failure under load

SCIENCE	MATH — NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction kinetic and potential] Effects of friction on work processes and product quality Inertia and momentum Newton's Laws of Motion Lubricants</p> <p>Gas under pressure Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching] Effects of lubricants</p>	Operating dimensions
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading</p> <p>Speaking</p> <p>Writing</p> <p>Viewing</p>	<p><u>EXAMPLES</u></p> <p>Repair service order</p> <p>Parts and repair manual</p> <p>Instructions to operator</p> <p>Requisition for parts</p> <p>Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, trade terminology</p> <p>Description of mechanism, definition, instructions</p> <p>Trade terminology, enunciation, clarity of expression, logic</p> <p>Penmanship, spelling, classification terminology</p> <p>Visual analysis, describing, logic, detail/inference</p>

(TASK STATEMENT) MAINTAIN PNEUMATIC CLUTCH

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Grease gun Grease Flashlight End wrenches Air pressure gauge	Lock out main switch Lubricate bearings Check and adjust limit switches Check air pressure	Safety glasses Grease spills Pinch points Slips or falls [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedules	<u>ERRORS</u> Machine failure under stress

TASK STATEMENT) MAINTAIN PNEUMATIC CLUTCH

SCIENCE		MATH - NUMBER SYSTEMS	
Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction, kinetic and potential] Inertia and momentum Newton's Law of Motion Lubricants Gas under pressure Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Resistance of materials to change in shape [stretching]		Operating dimensions	
COMMUNICATIONS			
PERFORMANCE MODES		EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing		Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty L Inspecting, Repairing, and Maintaining Acme Feed Screw

- 1 Inspect acme feed screw
- 2 Repair acme feed screw (milling machine)
- 3 Maintain acme feed screw (milling machine)

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(TASK STATEMENT) INSPECT ACME FEED SCREW

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth	Stop machine lock out Inspect lubrication Hand crank table to center Work crank back and forth to denote looseness Inspect screw for burrs and roughness, sharp corners Check end play of screw	Safety glasses [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine if repairs are needed	<u>CUES</u> Condition of equipment Rough finish out of tolerance on machined part	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) INSPECT ACME FEED SCREW

SCIENCE		MATH - NUMBER SYSTEMS	
Simple machines used to gain mechanical advantage Work input, work output, friction and efficiency in simple machines Fluids under pressure Inertia and momentum [body at rest - body in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape [resist to twisting, bending] Effects of lubricants		Dimensional tolerance Operating dimensions	
COMMUNICATIONS			
PERFORMANCE MODES		EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching		Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR ACME FEED SCREW (MILLING MACHINE)

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Ratchet wrench and sockets Socket head set Oil Flashlight Screwdrivers A-frame on wheels Sling Pick up clamps Stoddard solvent Wiping cloth End wrenches Face spanner wrenches New feed screw New feed nuts New feed screw bearings	Lock out main switch Crank knee down Crank saddle out Remove tooling from table Remove end brackets cranks, feed dials and bearings Remove feed screw Remove table gib Remove table Remove feed nuts Install new feed nuts Replace table Install gib and adjust Install new feed screw and bearings Adjust feed nuts Lube screw and check operation	Safety glasses Pinch points Only operator to load or unload machine [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine whether to install new parts or repair	<u>CUES</u> Feed screw and nuts Condition and life span of parts	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) REPAIR ACME FEED SCREW (MILLING MACHINE)

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [linear motion to rotary motion] Work input, work output, friction and efficiency in simple machines [friction] Fluids under pressure [lubricant] Centrifugal forced developed by bodies in rotation [body at rest - body in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape [stretching]</p>	<p>Wrench dimensions Measures of length [measurement] Operating dimensions</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading</p> <p>Speaking</p> <p>Writing</p> <p>Viewing</p>	<p><u>EXAMPLES</u></p> <p>Repair service order</p> <p>Parts and repair manual</p> <p>Instructions to operator</p> <p>Requisition for parts</p> <p>Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, trade terminology</p> <p>Description of mechanism, definition, instructions</p> <p>Trade terminology, enunciation, clarity of expression, logic</p> <p>Penmanship, spelling, classification, terminology</p> <p>Visual analysis, describing, logic, detail/inference</p>

(TASK STATEMENT)

MAINTAIN ACME FEED SCREW (MILLING MACHINE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Socket head wrench Screwdriver Wiping cloth Flashlight	Lock out main switch Adjust screw linear looseness (end play) Hand crank table to extreme right Adjust feed nuts Hand crank table to extreme left Check feed nuts Assure lubrication	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance service to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN ACME FEED SCREW (MILLING MACHINE)

SCIENCE	MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage Work input, work output, friction and efficiency in simple machines Fluids under pressure [lubricants] Inertia and momentum [bodies at rest - bodies in motion] Effects of friction on work processes and product quality Resistance of materials to change in shape Effects of lubricants</p>	<p>Wrench dimensions Measures of length [measurement] Operating dimensions</p>
COMMUNICATIONS	
<p><u>PERFORMANCE MODES</u></p> <p>Reading</p> <p>Speaking</p> <p>Viewing</p>	<p><u>EXAMPLES</u></p> <p>Preventative maintenance schedule</p> <p>Instructions to operator</p> <p>Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, description of mechanism, trade terminology</p> <p>Trade terminology, enunciation, clarity of expression, logic</p> <p>Visual analysis, describing, logic, detail inference</p> <p>94</p>

Duty M Inspecting, Repairing, and Maintaining Ball Nut Feed Screw

- 1 Inspect ball screw nut feed
- 2 Repair ball screw looseness
- 3 Maintain ball screw

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(TASK STATEMENT) INSPECT BALL SCREW NUT FEED

(TASK STATEMENT) TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Flashlight Lint free wiping cloths Indicator	Lock out main switch Wipe screw thread clean of oil and dirt Inspect screw thread for wear and roughness Indicate table for linear motion Inspect mounting screws Hand crank table end to end, feel for smooth operation Listen for unusual sounds (grinding) Check lubrication	Safety glasses Clean lint free wiping cloth [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Unusual sounds, condition of equipment	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) INSPECT BALL SCREW NUT FEED

SCIENCE	MATH -- NUMBER SYSTEMS
<p>Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [change of dimensions] Fluids under pressure [oil under pressure] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [composition of matter] Transfer of energy from one form to another Inertia and momentum Effect of friction on work processes and product quality Resistance of materials to change in shape Effects of lubrication</p>	<p>Plus and minus on indicator Operating dimensions</p>

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
<p>Reading Speaking Viewing Listening Touching</p>	<p>Inspection order Instructions to operator Inspection of equipment Operating equipment Surface and parts</p>	<p>Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration noise discrimination Shape, texture, movement, tension</p>

(TASK STATEMENT) REPAIR BALL SCREW LOOSENESS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Flashlight Wiping cloth (lint free) Ratchet and sockets Socket head wrenches Indicator with magnetic base Screwdrivers Hammer Horses (wood topped) Micrometer outside 0"-1" Depth micrometer Wire</p>	<p>Lock out main switch Remove oil motor drive, driving coupling from screw, table end brackets Secure ball nut on ball screw (wire, cloth) Remove ball nut bolts from table, assembly of screw and ball nuts, and bolts from nut halves and remove dowels Move slightly to remove spacer Grind spacer to desired thickness Reinstall spacer, dowels and bolts Use dial indicator to verify looseness Remove all looseness by regrinding spacer; reinstall screw assembly and end brackets Remove one bearing thrust plate and grind to desired length; reinstall and check for end play of screws Reinstall oil motor Manually operate automatic lubricator Check for operation</p>	<p>Safety glasses Slips from oil spills Handle assembly carefully Secure ball nut or it will windmill (mashed fingers) No rings Clean, lint-free wiping cloth Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries</p>
<p><u>DECISIONS</u></p> <p>Determine adjustment Loose ball screw</p>	<p><u>CUES</u></p> <p>Condition and life span of parts</p>	<p><u>ERRORS</u></p> <p>Wear from usage</p>

ASK STATEMENT) REPAIR BALL-SCREW LOOSENESS

SCIENCE	MATH - NUMBER SYSTEMS
<p>Work input, work output, friction and efficiency in simple machines</p> <p>Effect of heating and cooling on expansion of materials [heat, change of dimensions]</p> <p>Fluids under pressure [oil under pressure]</p> <p>Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements [hardness]</p> <p>Transfer of energy from one form to another [from oil pressure to linear measurement]</p> <p>Inertia and momentum</p> <p>Effects of friction on work processes and product quality</p> <p>Arrangement of molecules, atoms and ions and the effect on structure and strength of materials [structure rearrangement]</p> <p>Resistance of materials to change in shape</p> <p>Effects of lubrication</p>	<p>Measures of length [decimal]</p> <p>Wrench dimensions</p> <p>Operating dimension</p>

COMMUNICATIONS

<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Writing Viewing	Repair service order Parts and repair manual Instructions to operator Requisition of parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarification of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN BALL SCREW

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth (lint free) Ratchet wrench and sockets Socket head wrenches	Lock out main switch Wipe screw clean Adjust lubricator Tighten ball nut mounting screws Tighten end plate mounting screws	Safety glasses Slips on oil spills Clean lint free wiping cloth [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN BALL SCREW

SCIENCE		MATH - NUMBER SYSTEMS
<p>Work input, work output, friction and efficiency in simple machines</p> <p>Effect of heating and cooling on expansion of materials [change of dimensions]</p> <p>Liquids under pressure [oil under pressure]</p> <p>Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements</p> <p>Transfer of energy from one form to another</p> <p>Inertia and momentum</p> <p>Effects of friction on work processes and product quality</p> <p>Resistance of materials to change in shape</p>		<p>Wrench dimensions</p> <p>Operating dimensions</p>
COMMUNICATIONS		
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty N Inspecting, Repairing, and Maintaining Fluid Feed Screw .

- 1 Inspect fluid feed screw (oil cylinder)**
- 2 Repair fluid feed screw oil cylinder (milling machine)**
- 3 Maintain fluid feed screw (oil cylinder) milling machine**

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(TASK STATEMENT) INSPECT FLUID FEED SCREW (OIL CYLINDER)

103

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Wiping cloth Flashlight Ratchet wrench and sockets Socket head wrenches (Allen)	Remove both aprons Operate table from end to end Inspect for leaks Inspect piston rod for scores and nicks Inspect hold down bolts	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Condition of equipment, leaks, scores, nicks	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) INSPECT FLUID FEED SCREW (OIL CYLINDER)

SCIENCE		MATH — NUMBER SYSTEMS
Work input, work output, friction and efficiency in simple machines Fluids under pressure Forces acting on a body immersed or floating in a liquid Transfer of energy from one form to another Inertia and momentum [Pascals Law] Effects of lubricants	Wrench dimensions Operating dimensions	
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching	Inspection order Instruction to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarification of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR FLUID FEED SCREW OIL CYLINDER (MILLING MACHINE)

105

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Socket head wrenches End wrenches Tubing box wrench Screwdrivers Wiping cloths Spdi-dri Flashlight Cylinder rod seal	Remove table apron - rod end Move table to expose piston rod and cylinder end Lock out main switch Unbolt piston rod from bracket on frame Loosen fitting on hydro line on opposite end of cylinder Push piston rod clear of bracket Remove seal gland and oil seal Install new seal Reinstall gland Reinstall piston rod in end bracket Tighten loosened oil line fitting Start machine Operate machine end to end Bleed air from cylinder - both ends Start machine check for operation, leaks Reinstall table apron	Safety glasses Caution - working on moving machinery Slips from oil spills or leaks Do not attempt to take dimensions while machine is in motion When using knives, screwdrivers or any cutting tool do not direct the strain toward self or another employee Do not use screwdrivers as chisels or pry bars [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
DECISIONS	CUES	ERRORS
Determine whether to install new seal	Condition and lifespan of parts	Constant usage Leakage Machine failure under load

TASK STATEMENT) REPAIR FLUID FEED SCREW OIL CYLINDER (MILLING MACHINE)

SCIENCE	MATH - NUMBER SYSTEMS
<p>Work input, work output, friction and efficiency in simple machines</p> <p>Fluids under pressure</p> <p>Forces acting on a body immersed or floating in a liquid</p> <p>Transfer of energy from one form to another</p> <p>Inertia and momentum</p> <p>Pascal's Law</p> <p>Effects of lubricants</p>	<p>Wrench dimensions</p> <p>Number of oil seal</p> <p>Operating dimensions</p>

COMMUNICATIONS

<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
<p>Reading</p> <p>Speaking</p> <p>Writing</p> <p>Viewing</p>	<p>Repair service order</p> <p>Parts and repair manuals</p> <p>Instructions to operator</p> <p>Requisition for parts</p> <p>Equipment</p>	<p>Comprehension, detail/inference, trade terminology</p> <p>Description of mechanism, definition, instructions</p> <p>Trade terminology, enumeration, clarity of expression, logic</p> <p>Penmanship, spelling, classification, terminology</p> <p>Visual analysis, describing, logic, detail/inference</p>

(TASK STATEMENT) MAINTAIN FLUID FEED SCREW (OIL CYLINDER) MILLING MACHINE

107

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY — HAZARD
Socket head wrenches Ratchet wrench and sockets Flashlight Wiping cloth	Operate table end to end Remove apron on both ends Observe for leakage Stop leaks Tighten hold down bolts Reinstall aprons	Safety glasses [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance service to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN FLUID FEED SCREW (OIL CYLINDER) MILLING MACHINE

SCIENCE		MATH — NUMBER SYSTEMS	
Work input, work output, friction and efficiency in simple machines Fluids under pressure Forces acting on a body immersed or floating in a liquid Transfer of energy from one form to another Inertia and momentum Pascal's Law Effects of lubricant		Wrench dimensions Operating dimensions	
COMMUNICATIONS			
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS	
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference	
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Duty 0 . Inspecting, Repairing, and Maintaining Anti Friction Bearings

- 1 Inspect anti friction bearing (roller or ball)
- 2 Repair anti friction bearing (roller or ball)
- 3 Maintain anti friction bearing (roller or ball)

(TASK STATEMENT) INSPECT ANTI-FRICTION BEARING (ROLLER OR BALL)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
<p>Flashlight Wiping cloth Contact thermometer Aligning bar (straight edge)</p>	<p>Inspect lubrication Check for excessive heat Check for excessive vibration Check for excessive noise</p>	<p>Safety glasses Grease on floor Caution: rotating shaft [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<p><u>DECISIONS</u> Determine repairs needed</p>	<p><u>CUES</u> Condition of equipment, temperature, noise, vibration</p>	<p><u>ERRORS</u> Machine failure under load</p>

TASK STATEMENT) INSPECT ANIT-FRICTION BEARING (ROLLER OR BALL)

TASK STATEMENT) INSPECT ANIT-FRICTION BEARING (ROLLER OR BALL)		MATH — NUMBER SYSTEMS
SCIENCE Simple machines used to gain mechanical advantage [pulleys] Work input, work output, friction and efficiency in simple machines [friction] Effect of heating and cooling on expansion of materials Fluids under pressure [lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubrication		Basic math skills (read thermometer) Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES Reading Speaking Viewing Listening Touching	EXAMPLES Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts	SKILLS/CONCEPTS Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR ANTI-FRICTION BEARING (ROLLER OR BALL)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
<p>Ratchet wrench and sockets Socket bead wrenches Flashlight Wiping cloth Stoddard solvent Jack Timber File Emory cloth Oil Surface thermometer</p>	<p>Lock out main switch Jack up bearing shaft and block Remove bearing Clean and inspect bearing for possible reuse Reinstall old bearing if possible to reuse Lower shaft, secure bearing mount Check and adjust alignment Lubricate Run and check operation Feel for heat Feel for vibrations Listen for unusual noise</p>	<p>Safety glasses Pinch points Splinters from timber (wear gloves) [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<p><u>DECISIONS</u></p> <p>Determine whether to reuse or replace bearing</p>	<p><u>CUES</u></p> <p>Dirty, noisy, heat Lack of lube Life span of parts Expense of bearing</p>	<p><u>ERRORS</u></p> <p>Machine failure under load Unnecessary expense</p>

TASK STATEMENT) REPAIR ANTI-FRICTION BEARING (ROLLER OR BALL)

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulley] Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of materials [expansion due to heat] Fluids under pressure [proper lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubrication		Wrench dimensions Measures of length Measures of temperature [bearings] Liquid and dry measures [oil] Operating dimensions
COMMUNICATIONS		
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Writing Viewing	Repair service order Parts and repair manual Instructions to operator Requisition for parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

(TASK STATEMENT) MAINTAIN ANTI-FRICTION BEARING (ROLLER OR BALL)

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth Lubricant Ratchet wrench and sockets Socket head wrenches	Lock out main switch Wip off exterior Lubricate bearing Loosen bearing bolts Align bearing Tighten mounting bolts Run and check	Safety glasses Grease on floor [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) MAINTAIN ANTI-FRICTION BEARING (ROLLER OR BALL)

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [pulley] Work input, work output, friction and efficiency in simple machines Effect of heating and cooling on expansion of material [expansion due to heat] Fluids under pressure [lube] Inertia and momentum Effects of friction on work processes and product quality Effects of lubricants		Wrench dimensions Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty P Inspecting, Repairing, and Maintaining Control Systems

- 1 Inspect control system (linkage and levers)**
- 2 Repair control systems (linkage and levers)**
- 3 Maintain control system (linkage and levers)**

(TASK STATEMENT) INSPECT CONTROL SYSTEM LINKAGE AND LEVERS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Flashlight Wiping cloth	Shut off machine Hand operate levers Feel for looseness Visually inspect pins, levers for deformations (wear, twist, bends) Start machine Feel for looseness Listen for vibrations and rattles	Safety glasses [Smoking not permitted where flamma- ble liquids and paint are being stored/used or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Condition of equipment	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) INSPECT CONTROL SYSTEM LINKAGE AND LEVERS

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers and linkage] Effects of lubricants		Basic math skills Operating dimensions
COMMUNICATIONS		
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Reading Speaking Viewing Listening Touching	Inspection order Instructions to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

(TASK STATEMENT) REPAIR CONTROL SYSTEMS (LINKAGE AND LEVERS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Flashlight Ratchet wrench and sockets Socket head wrenches Electric drill High speed drills Reamers (rose type) Pliers Ball peen hammer Oil can Oil Anvil or steel plate Cotter keys Oversize linkage pins</p>	<p>Lock out main switch Dismantle levers, pins, linkage, fork and bar shifter and pinions gears, and quadrant gear shifter Drill and ream levers and linkage Install oversized pins and cotter keys Straighten shifting levers Linkage and fork Replace sleeve bearings as required Check spring, de tent tooth and slot</p>	<p>Safety glasses Pinch points Report all injuries [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<u>DECISIONS</u> Determine whether to repair or place parts	<u>CUES</u> Condition and lifespan of parts	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) REPAIR CONTROL SYSTEMS (LINKAGE AND LEVERS)

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [levers, linkage] Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements Transfer of energy from one form to another [spring] Effects of friction on work processes and product quality [detent] Relationship of force to distortion in an elastic body [spring] Resistance of materials to change in shape [spring compression] Effects of lubricant		Basic math skills Wrench sizes dimensions Drill sizes Reamer sizes Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Writing Viewing	Repair service order Parts and repair manual Instructions to operator Requisition for parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

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(TASK STATEMENT) MAINTAIN CONTROL SYSTEM (LINKAGE AND LEVERS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD 121
Flashlight Oil can Oil Wiping cloth	Shut off machine Lubricate linkage and pins Start machine and actuate lever in all positions Check for correct operation: linkage pins, cotter keys	Safety glasses Oil spills Slips and falls Pinch points [Smoking not permitted where flammable liquids and paint are being stored/used or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance services to perform	<u>CUES</u> Standard preventative maintenance schedule	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN CONTROL SYSTEM (LINKAGE AND LEVERS)

MAINTAIN CONTROL SYSTEM (LINKAGE AND LEVERS)		MATH - NUMBER SYSTEMS
SCIENCE	Simple machines used to gain mechanical advantage {levers and linkage} Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements {hardness} Effects of lubricants	Basic math skills Operating dimensions
COMMUNICATIONS		
<u>PERFORMANCE MODES</u> Reading Speaking Viewing	<u>EXAMPLES</u> Preventative maintenance schedule Instructions to operator Equipment	<u>SKILLS/CONCEPTS</u> Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

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Duty Q Inspecting, Repairing, and Maintaining Hydraulic, Pneumatic, and Vacuum Components and Systems

- 1 Inspect hydraulic, pneumatic, vacuum components and systems
- 2 Repair hydraulic, pneumatic, vacuum components and systems
- 3 Maintain hydraulic, pneumatic, vacuum components and systems

(TASK STATEMENT) INSPECT HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Flashlight Wiping cloth Fox boro recorder	Operate system, at full capacity Inspect flow and pressures Inspect for leaks Inspect hose for wear Inspect safety cables on high pressure hoses and lines Inspect all fittings Inspect drive belts Inspect pulleys for wear Inspect lubricants Inspect for smooth operation Hand check for vibration Check hold down bolts Check hour meters time factor Listen for unusual noise Check vacuum systems	Safety glasses [Smoking not permitted where flammable liquids and paint are being stored/used or posted] [Report all injuries]
<u>DECISIONS</u> Determine repairs needed	<u>CUES</u> Condition of equipment	<u>ERRORS</u> Machine failure under load

ASK STATEMENT) INSPECT HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gears pulleys] Conversion of pressure of fluids and gases to linear or rotary motions Effects of lubricants		Basic math skills Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching	Inspection order Instructions to operator Inspection of equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration, noise discrimination Shape, texture, movement, tension

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(TASK STATEMENT) REPAIR HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD 126
<p>Test gauges (master) Flow meter Miss hardware (pipe fittings, etc.) Filter elements O-rings Ratchet wrench set Socket head wrench set End wrench set Screwdrivers Ball peen hammer Tube cutter Hack saw Putty knife Stoddard solvent Wiping cloths Emery cloth Sealant Taper pin Oil can and oil Fox boro recorder Air hose and blow gun</p>	<p>Lock out main switch Remove cover plate from reservoir Clean interior; clean and/or replace filter; check and replace as required; all tubing, piping and fittings Replace cover Remove and dismantle valves; replace defective parts; reassemble and install valves Remove pump and disassemble; replace defective parts; reassemble and install Calibrate pressure gauges Refill lubrication system and hydraulic system, if required; bleed air from hydraulic lines; run system and check flow and pressures; visually check accumulators, actuators, seals, safety controls, receivers, mufflers, fans fittings, drive and general conditions Blow out heat exchanger and check system</p>	<p>Safety glasses Pinch points Oil spills Caution: high pressure on air and oil lines Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries</p>
<p><u>DECISIONS</u></p> <p>Determine whether to repair or replace defective parts</p>	<p><u>CUES</u></p> <p>Hour meter, dust, dirt, normal wear, leaks</p>	<p><u>ERRORS</u></p> <p>Machine failure under load</p>

TASK STATEMENT) REPAIR HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEM

SCIENCE		MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [levers, gears, pulleys] Work input, work output, friction and efficiency in simple machines Fluids under pressure Transfer of energy from one form to another Transfer of heat from one body to another Inertia and momentum Effects of friction on work processes and product quality Effects of lubricants</p>		<p>Basic math skills Wrench dimensions Operating dimensions</p>
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
<p>Reading Speaking Writing Viewing</p>	<p>Repair service order Parts and repair manual Instructions to operator Requisition of parts Equipment</p>	<p>Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference</p>

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(TASK STATEMENT) MAINTAIN HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Flashlight Wiping cloth End wrenches Hydraulic oil Lube oil Grease gun Fox boro recorder Test gauges (master)	Lock out main switch Remove, clean or replace external filter Check belt drives Adjust tension Lube variable belt adjustments Check all fittings Check all hose Tighten as required Check pressure gauges, correct errors Check flows, correct errors Check all valves, replace packing Check oil for viscosity Check oil for contaminants Refill hydraulic oil if required Check vacuum for leaks Bleed air from hydraulic system	Safety glasses Pinch points [Smoking not permitted where flamma- ble liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine maintenance service to perform	<u>CUES</u> Standard preventative maintenance	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) MAINTAIN HYDRAULIC, PNEUMATIC, VACUUM COMPONENTS AND SYSTEMS

SCIENCE		MATH - NUMBER SYSTEMS
<p>Simple machines used to gain mechanical advantage [levers, gears, pulleys and belts] Work input, machines Effect of heating and cooling on expansion of materials Fluids under pressure [transfer of pressure] Transfer of energy from one form to another [gas under pressure] Inertia and momentum Effects of friction on work processes and product quality Relationship of force to distortion in an elastic body [packing and O-rings] Resistance of materials to change in shape Effects of lubricants</p>		Basic math skills Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing	Preventative maintenance schedule Instructions to operator Equipment	Comprehension, detail/inference, description of mechanism, trade terminology Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference

Duty R Inspecting, Repairing, and Maintaining Installation Machinery

1 Install machinery

(TASK STATEMENT) INSTALL MACHINERY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Thermometer (contact) Levels (spirit) Plumb bobs Bronson or Wild optical transit Snips Shim stock Stoddard solvent Wiping cloth Putty knife</p>	<p>Uncrate machine, assist setting on foundation; clean exterior Level machine with spirit level and/or optical transit Cut shim stock Tighten hold down bolts Recheck for level, adjust accordingly Lubricate machine; check all movements and for missing parts (bill of lading) Adjust tension on drive belts Start machine, run four hours at medium speed Check bearings for heat, gear box oil, for all tools, for parts manual, for operators manual, and for smooth operating conditions Operate at speeds and feeds Check all trips and stop dogs, automatic movement reversals and automatic lubers Check for safety features</p>	<p>Safety glasses Smoking not permitted where flammable liquids and paint are being used/stored or posted Report all injuries</p>
<p><u>DECISIONS</u> Determine adjustments needed</p>	<p><u>CUES</u> Operation of machinery</p>	<p><u>ERRORS</u> Machine failure under load</p>

(TASK STATEMENT) INSTALL MACHINERY

SCIENCE		MATH - NUMBER SYSTEMS
Simple machines used to gain mechanical advantage [gear, levers] Work input, work output, friction and efficiency in simple machines Effects of heating and cooling on expansion of materials Fluids under pressure Effects of lubricants		Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Speaking Viewing Listening Touching	Installation order Parts and operators manual Instructions to operator Inspect equipment Operating equipment Surface and parts	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Trade terminology, enunciation, clarity of expression, logic Visual analysis, describing, logic, detail/inference Auditory discrimination, concentration noise discrimination Shape, texture, movement, tension

Duty S Inspecting, Repairing, and Maintaining Service Bearings

1 Replace bearing (sleeve)

(TASK STATEMENT) REPLACE BEARING (SLEEVE)

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Scrapers Oil stone Hi-spot prussian blue Oil Timber Ratchet wrench Wiping cloth	Secure drive mechanism Loosen bolts in bearing block Raise shaft slightly Remove bearing block Remove sleeve from block Place prussian blue on shaft Slide new bearing on shaft Lower shaft Rotate shaft Remove bearing and scrape, clean shaft Clean bearing Lube shaft and bearings Reassemble Run and check	Safety glasses Caution - sharp tools Pinch points Do not use cotton waste or dirty cloths to wipe bearings Do not use incorrect kind of lubricant [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine whether to repair or replace bad bearing	<u>CUES</u> Excess oil leakage Looseness Vibration	<u>ERRORS</u> Machine failure under load

TASK STATEMENT) REPLACE BEARING (SLEEVE)

SCIENCE		MATH - NUMBER SYSTEMS
Lubricant Sae-Numbers and meanings Transfer of heat from one body to another Effects of friction on work processes and product quality Effects of lubricants		Measures of length (length ID and OD) Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Viewing	Repair service order Parts and repair manual Requisition of parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Penmanship, spelling, classification, terminology Visual analysis, describing, logic detail/inference

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Duty T Inspecting, Repairing, and Maintaining Weld Shaft Padding

1 Weld-build up shaft by padding

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(TASK STATEMENT) WELD-BUILD UP SHAFT BY PADDING

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Arc welder Helmet Electrodes Chipping hammer Wire brush Vee blocks	Clean shaft Position shaft on vee blocks Acquire type of metal of shaft Acquire correct electrode Set proper amperage Weld in proper sequence Chip slag and brush each bead of weld Overlap each bead 1/3 Check porosity, visually inspect etch with dilute solution of nitric acid Machine welded sections back to original dimensions	Safety glasses Leather gloves Protective clothing Always pour acid into water Keep welding stubs off floor Check for flammable material before welding Have water type extinguisher Curtailed to protect others from arc rays Faceshield, rubber gloves and apron when handling acid [Smoking not permitted where flammable liquids and paint are being used/stored or posted]
<u>DECISIONS</u> Determine if surface is worn	<u>CUES</u> Frozen bearing	<u>ERRORS</u> Machine failure

TASK STATEMENT) WELD-BUILD UP SHAFT BY PADDING

SCIENCE		MATH - NUMBER SYSTEMS
Effect of heating and cooling on expansion of material Transfer of heat from one body to another Effects of friction on work processes and product quality Composition of matter, including protons, neutrons, electrons, atoms, molecules, elements Electrode: tensile strength, yield point, elongation, melt off rate Cohesion Adhesion		Measurement of length Read and interpret charts, tables, and/or graphs [charts for amperage settings] Operating dimensions
COMMUNICATIONS		
PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Viewing	Repair service order Parts and repair manual Requisition for parts Equipment	Comprehension, detail/inference, trade terminology Description of mechanism, definition, instructions Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

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Duty U Inspecting, Repairing, and Maintaining Harden Solder

- 1 Sharpen drill
- 2 Silver solder joint

(TASK STATEMENT) SHARPEN DRILL

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Grinding wheel (water cooled) Drill grinding gage Stone dresser Goggles	Dress face of stone Readjust tool rest Lip clearance 80 to 120 High speed drill High carbon Carbide tip	Safety glasses Disconnect power supply when changing grinding wheels Stand to one side when dressing grinding wheel Never "dig" into the side of a grinding wheel. It will throw wheel out of balance Tool rests to be adjusted to 1/8 inch or less from face of stone [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine if the drill is dull	<u>CUES</u> Length and angle of tips Dull cutting edge	<u>ERRORS</u> No lubricant and/or coolant Drill failure

ASK STATEMENT) SHARPEN DRILL

SCIENCE		MATH - NUMBER SYSTEMS
Effect of friction on work processes and product quality Arrangement of molecules, atoms and ions and the effect on structure and strength of materials Motion resulting from two or more forces acting on a point in a body [motion] Composition of stone Use of coolant to absorb heat during grinding	Index drill calibration Operating dimensions	
COMMUNICATIONS		
<u>PERFORMANCE MODES</u>	<u>EXAMPLES</u>	<u>SKILLS/CONCEPTS</u>
Viewing	drill	Visual analysis, describing, logic, detail/inference, recognize symbol codes and emblems

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(TASK STATEMENT) SILVER SOLDER JOINT

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
<p>Emery cloth Silver solder Flux Oxy-acetylene torch Goggles Flint lighter File Deburrer Copper tubing Copper elbow Pliers Hack saw Fire extinguisher</p>	<p><u>Clean surface</u> Check silver content of solder Identify correct flux Adjust proper flame on torch Melting point of solder <u>Melting point of copper</u></p>	<p>Safety glasses Goggles Gloves Report all injuries to your foreman Check fire extinguisher Dispose of scrap material in scrap hopper All files must have handles Check for flammable material Never use cigarette or match to light torch Relieve pressure on pipe before starting job Empty pipe <u>completely</u> before soldering [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]</p>
<u>DECISIONS</u> Determine whether to use silver solder or soft solder	<u>CUES</u> Vibration factor	<u>ERRORS</u> Weld does not hold

TASK STATEMENT) SILVER SOLDER JOINT

TASK STATEMENT) SILVER SOLDER JOINT		MATH - NUMBER SYSTEMS
SCIENCE	Effects of heating and cooling on expansion of material Transfer of heat from one body to another Arrangement of molecules, atoms, ions and the effect on structure and strength of materials Theory of attraction of unlike metals Cohesion Adhesion	Measures of length, OD and ID
COMMUNICATIONS		
<u>PERFORMANCE MODES</u> Reading Writing Viewing	<u>EXAMPLES</u> Repair service order Parts and repair manual Requisition for parts Equipment	<u>SKILLS/CONCEPTS</u> Comprehension, detail/inference, trade terminology Description of mechanism, definition, instruction Penmanship, spelling, classification, terminology Visual analysis, describing, logic, detail/inference

Duty V Inspecting, Repairing, and Maintaining Bending Pipe

1 Wrinkle bend pipe to 90°

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TASK STATEMENT) WRINKLE BEND PIPE TO 90°

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Pipe Oxy-acetylene torch Goggles Flint lighter Rule Soap stone Large vise Chalk line Framing square Fire extinguisher	Layout Adjust torch Observe critical temperature Apply bending force Time heat belts Check for accuracy	Safety glasses Goggles Burns and radiation Gloves Fire extinguisher Check area for flammable material Never use cigarette or match to light torch [Smoking not permitted where flammable liquids and paint are being used/stored or posted] [Report all injuries]
<u>DECISIONS</u> Determine size of pipe Determine radius size	<u>CUES</u> Type of machinery	<u>ERRORS</u> Inaccurate measurement

ASK STATEMENT) WRINKLE BEND PIPE TO 90°

SCIENCE	MATH - NUMBER SYSTEMS
<p>Effects of heating and cooling on expansion of material</p> <p>Resistance of materials to change in shape [bending]</p> <p>Melting point of liquid oxygen</p> <p>Acetone</p> <p>Conditions of metals-stages: Alpha, Beta, Gamma and Delta</p> <p>Composition of metals</p> <p>Effects of heat on metals</p> <p>Hardening or annealing</p> <p>Elongation and/or expansion of metals per degree of heat</p>	<p>Measure of length [measurements]</p> <p>Use of arcs or chord in determining facts about a circle or its parts</p> <p>Determination of facts involving sectors of a circle</p> <p>Determination of facts involving lines tangent to circles</p> <p>Operating dimensions</p>
PERFORMANCE MODES	COMMUNICATIONS
<p>Reading</p> <p>Writing</p> <p>Viewing</p>	<p><u>EXAMPLES</u></p> <p>Repair service order</p> <p>Parts and repair manual</p> <p>Requisition for parts</p> <p>Equipment</p> <p><u>SKILLS/CONCEPTS</u></p> <p>Comprehension, detail/inference, trade terminology</p> <p>Description of mechanism, definition, instructions</p> <p>Penmanship, spelling, classification, terminology</p> <p>Visual analysis, describing, logic, detail/inference</p>

INDEX 1
INDUSTRIAL MECHANICS RESPONSIBILITIES

- 1 wear eye protection
- 2 arrive promptly on service call
- 3 contact operator, have machine shut off and secured
- 4 have operator explain problem as seen
- 5 before attempting work - pull master switch off and secure switch
- 6 attempt to ascertain repairs required
- 7 lay plan of action
- 8 make repairs
- 9 reverse proceedings 3 and 5
- 10 have operator accept as OK
- 11 return to maintenance for new assignment

INDEX 2
FREQUENCY OF SOME PREVENTATIVE MAINTENANCE PROCEDURES

- 1 adjust belts, clean and inspect --- $\frac{1}{2}$ year
- 2 check feed screws and adjust as **required** ---1 year
- 3 adjust auto lubers ---1 year
- 4 check sight glass oil levels (operator) ---daily
- 5 lube non-shielded motor ball bearings --- $\frac{1}{2}$ year
- 6 check vibration amplitude all electric motors ---1 year
- 7 adjust gibs and examine all machines except the gibs on grinders
--- $\frac{1}{2}$ year
- 8 adjust gibs and examine on grinders ---- $\frac{1}{2}$ year
- 9 deburr machine ways ---1 year

INDEX-3
EMPLOYEES PERSONAL TOOLS

- 1 crescent wrench 6 inch
- 1 crescent wrench 10 inch
- 1 crescent wrench 3 inch
- 1 small proxyln hammer 10 inch handle
- 1 standard small ball peen hammer 10 inch handle
- 1 standard medium ball peen hammer 14 inch handle
- 1 standard set $\frac{1}{4}$ inch drive English socket wrenches
- 1 standard set $\frac{1}{2}$ inch drive English socket wrenches
- 4 standard set pin punches
- 4 standard set center punches
- 4 standard set steel cut chisels
- 6 standard set screwdrivers
- 1 standard adjustable hack saw
- 1 set open end wrenches to 1 inch
- 1 set box end wrenches to 1 inch
- 1 standard small pliers
- 1 standard medium pliers
- 1 standard large pliers
- 2 channel lock pliers $6\frac{1}{2}$ inch- $9\frac{1}{2}$ inch
- 1 standard scriber
- 1 standard combination square (Starret or equivalent)
- 1 standard 0-1 inch outside micrometer (Starret or equivalent)
- 1 standard 1-2 inch outside micrometer (Starret or equivalent)
- 1 standard 0-3 inch depth micrometer (Starret or equivalent)
- 1 standard good pocket knife
- 1 standard set phillips drive screwdrivers
- 1 standard needle nose pliers small
- 1 standard needle nose pliers medium

INDEX 3 (CON'T)

- 1 set socket head wrenches to $\frac{3}{4}$ inch (Allen type)
- 1 persuader $\frac{1}{2}$ inch galvanized pipe 10 inch long
- 1 pair $6\frac{1}{2}$ inch vise grips
- 1 pair $9\frac{1}{2}$ inch vise grips
- 1 outside caliper 4 inch
- 1 inside caliper 4 inch
- 1 divider caliper 4 inch
- 1 rubber mallet
- 1 scale 6 inch
- 1 burring tool
- 1 set jewelers screwdrivers
- 1 magnifying glass 3 inch
- 1 safety 2 cell flashlight
- 1 pipe wrench 10 inch
- 1 ice pick in sheath
- 3 pencils
- 1 tablet
- 1 dental type mirror
- 1 machine hand book latest edition
- 1 drill and tap size chart
- 1 straight edge $\frac{1}{4}$ x 1 x 24 inches
- 1 straight edge $\frac{1}{4}$ x 2 x 48 inches
- 1 small tool box
- 1 large tool box